

Incident Investigation

- 1) **Incident Number:**
- 2) **Title:** R-16, 5354 Suspension Failure
- 3) **Classification:** Serious Incident
- 4) **Estimated Dollar Loss:** ***Total: \$45,600***
 - Raw Materials: \$32,000
 - Reactor Clean Out: \$9,600
 - Containment Area Cleanout: \$ 4,000
- 5) **Nature of Damage:** Suspension failure resulting in a partial dump to the pit and then the rest of the batch dumped to pit after reaction was completed, PSM B event due to styrene emissions
- 6) **Date and Time of Incident:** 03:18, 2/25/09, trip; bad sample at 05:50
- 7) **Date of Investigation:** 03/04/09
- 8) **Location:** EPS Building 4, Reactor 16
- 9) **Description of Incident:**

On 2/25/09, batch 075 in reactor 16 was charged at 02:01. This was the fifth batch of 5354 after a run of 5371. The batch timer began at 03:18. The batch proceeded as normal, with the first and second samples being estimated at 600 microns. Right at the time of the second sample, 05:32 there was a jacket profile alarm. The second sample was pulled and suspension verified at 800 microns. At 05:50, the third sample was pulled and found to be 4000 microns with styrene monomer still present. The 5th floor operator told the board operator to kill the batch and asked the 6th floor operator to add another 50 lbs of TCP for a total of 100 lbs for the kill. The shift supervisor was immediately notified. Another sample was pulled and there was no suspension. R-14 & R-17 were cooling and R-15 & R-18 were down.

Due to the complete loss of suspension, the decision was made to immediately use PVA in an attempt to get suspension back. The shift supervisor then notified the on call person and the Operations Manager. The first shot of PVA was added at 05:58. A sample was pulled and showed that suspension was back, though the sample was still concerning. Low jacket temperature alarms began at 05:58. Based on this, a second shot of PVA was added at 06:09. A sample was pulled and the suspension looked better. The reactor went into full cool at 06:08.

Despite all of these efforts, the reactor temperature began to climb. At 06:16 a third shot of PVA was added. The temperature continued to climb so in order to improve cooling, 1000 pounds of cold water were added at 6:26 with the temperature at 199°F. The temperature went down and then began rising again. At 6:31, 2000 pounds of cold water were added with the temperature at 199°F. A sample was taken and suspension was still present with a C Value around 1000 microns. The temperature once again began to climb. At 6:46, 2000 pounds of cold water were added with the temperature at 199°F. Pulled a sample and while suspension was still present, the operator could not get many beads. So, the agitator was sped up to 56 rpm at 6:51 and then 58 rpm at 6:55. Also at 6:55, 2000 pounds of cold water were added with the temperature at 199°F. At 7:05 1000 pounds of cold water were added.

With no more room in the reactor to add water for cooling and knowing that the batch was near completion of polymerization, it was decided to minimize emissions by performing a partial dump then further cooling the batch. The guard was notified to sound the assembly alarm at 7:06. The B-4 local alarm was sounded. The flare was shut down and the partial dump of the batch to the pit commenced at 07:14 with the water foggers on. The dump was stopped after a level drop of 40 inches. 5000 pounds of cold water were then added to the reactor in an effort to cool it. At this point, the reactor temperature became stable and began to drop. The batch was shutdown in the DCS at to prevent subsequent steps in the sequence from continuing and needing to be acknowledged by the DCS operator.

It was determined that the polymerization of the batch had concluded. Again, the guard was notified and an announcement was made on the radio and PA that the rest of the batch would be dumped to the pit. The local B-4 pit alarm was sounded. At 07:30 a dump of the batch to the pit commenced. Several water flushes of the reactor were done to get it empty.

After the event, it was confirmed that the two surfactant additions were properly made. Also, visual inspection of the suspension samples showed a stable suspension up until the bad sample. All raw materials used in the batch were successfully used on other batches without issue. Due to recent information that there may be a suspension effect caused by the AC3A, samples of this material from the batch were acquired. The A-81 was still on the table indicating that it had not been charged early. All indications of batch conditions, including level after each charge, reactor pressure and temperature, and jacket temperatures, were normal right up until the first jacket profile alarm. Due to recent concerns regarding back flush with city water, it was verified that there was no back flush prior to this batch.

10) Contributing Factors:

Since the root cause is undermined, the contributing factors are possibilities only and can not be confirmed. They are:

- * Limited experience producing this material type
- * R-16 (two similar failures on this product have occurred in this reactor)

11) Root Cause:

Unknown at this time, but could be a raw material issue on AC3A or TBP since this is the only modified grade using those materials.

12) Recommendations:

- i. Investigate potential issues with AC3A that might cause a suspension issue (Heitz, 5/31/09)
- ii. Investigate potential issues with TBP that might cause a suspension issue (Leckonby, 5/31/09)
- iii. Discuss with operators to see if they have ideas on why R-16 may be a cause (Emmett, 4/15/09)
- iv. Make sure R-16 water faucet for making PK is the same as the others (Emmett, 4/15/09)

13) Investigating Team

Team Leader: Cheryl Heitz, Operations Manager
Angela Heseman, Process Engineer
Roy Leckonby, TD Team Leader
Ganesh Krish, Environmental Engineer
Tony Bernardini, Shift Supervisor
Jeff Peterson, Process Operator
Bob Donahue, Process Operator